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## 13. ABSTRACT

The program was designed to present a range of topics and views within the broad theme of the conference. Sessions included papers on bulk and thin film crystal growth experiments and modeling, high  $T_c$  superconductors (uses and crystal growth), II-VI compounds, and crystal characterization. Twenty full length papers were presented in eight sessions, chaired by acknowledged experts in the session field. Each session chair gave an introduction to his session and fostered discussions following the presentations. Two papers included impressive videotape displays of the theory and practice of crystal growth that greatly enhanced the understanding of the subjects verbally presented. The format of the Gordon conference allows ample unstructured time for informal discussion of program and other related topics, and participants remarked on how much they enjoyed these active discussion periods to pursue points brought up in the 'formal' sessions. Students and newcomers to the crystal growth community gained much from interacting informally with experienced scientists and learning from them. One session devoted to short verbal presentations of posters, to introduce authors and topics to the audience, proved to be a very successful experiment. Poster viewing sessions followed later, when authors were able to discuss their work in more detail.

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## **GORDON RESEARCH CONFERENCE ON CRYSTAL GROWTH**

**Casa Sirena Marina Hotel, Oxnard, CA  
March 11-16 1990**

### **Chairman's Report for US Army Research Office**

The Gordon Conference on Crystal Growth had as its theme: "Crystals for Electronic, Optical, and Superconducting Applications", to reflect topics of current and future interest in the field of crystal growth as perceived by the Chairman and Vice-Chairman of the 1990 conference. The conference attracted sixty five participants from industry (27), universities (20), national laboratories (7) and overseas (11). The mix of participants from experienced leaders in the field to university students benefitted all.

The program was designed to present a range of topics and views within the broad theme of the conference. Sessions included papers on bulk and thin film crystal growth experiments and modeling, high  $T_c$  superconductors (uses and crystal growth), II-VI compounds, and crystal characterization. Twenty full length papers were presented in eight sessions, chaired by acknowledged experts in the session field. Each session chair gave an introduction to his session and fostered discussions following the presentations. Two papers included impressive videotape displays of the theory and practice of crystal growth that greatly enhanced the understanding of the subjects verbally presented. The format of the Gordon conference allows ample unstructured time for informal discussion of program and other related topics, and participants remarked on how much they enjoyed these active discussion periods to pursue points brought up in the 'formal' sessions. Students and newcomers to the crystal growth community gained much from interacting informally with experienced scientists and learning from them. One session devoted to short verbal presentations of posters, to introduce authors and topics to the audience, proved to be a very successful experiment. Poster viewing sessions followed later, when authors were able to discuss their work in more detail.

The program introduced many new aspects of crystal growth, including strained layer superlattices, quantum cluster growth, and vertical zone melting of GaAs. Modeling of growth processes has become very sophisticated now that powerful computers are available for solving complex equations, and models are now capable of useful application to experimental crystal growth for improvement of crystal quality. However, there is still much active discussion on the mathematical models used to predict crystal growth behavior. A very impressive paper was presented on dislocation generation in growing crystals, where dislocation distribution was successfully modeled. The characterization session presented a wide variety of techniques, including chemical etching for revealing dislocations, x-ray analysis for investigating thin film growth mechanisms, and electron microscopy for studying atomic-scale defect generation in crystals. The twenty one posters covered similar topics to those presented in the full paper sessions. The authors represented all sections of the crystal growth community, with five of the posters given by university students who are relatively new to the field. The poster session was of high caliber and included an excellent poster, and display of oxide crystals grown in Professor He Chong-Fan's Institute of Ceramics in Shanghai.

No proceedings are published to preserve the freedom of participants to voice their opinions, and present new and perhaps controversial data for review and frank discussion. The program, however, is available and is included here.

The site and organization of the conference were excellent, and conferees were very impressed with the high quality of the program and the high proportion of world renowned participants. It was an instructive, stimulating, interesting and enjoyable conference that we were very proud to be associated with. We are most grateful to USARO for granting funds that enabled us to invite the best speakers and participants, irrespective of their ability to finance themselves.

Margaret Brown (Conference Chairman)  
Michael DiGiuseppe (Conference Vice-Chairman)

March 20 1990



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**GORDON RESEARCH CONFERENCES**  
**CRYSTAL GROWTH**  
**CASA SIRENA MARINA HOTEL, OXNARD, CA**

**MARGARET BROWN** (Chairman)

**MICHAEL A. DiGIUSEPPE** (Vice Chairman)

**MARCH 11-16, 1990**

**Sunday, March 11, Conference Opens**

Afternoon: Arrival and Registration Check-in

Early Evening : Informal Social (6 - 7 pm)

Evening: Dinner (7 pm)

Note: All Meals Included in Registration Cost: from Sunday March 11, Dinner, to Friday, March 16, Lunch.

**Monday, March 12 - Friday, March 16, Technical Sessions**

**THEME FOR THE CONFERENCE:** Crystals for Electronic, Optical, and Superconducting Applications

**SESSION TITLE:** Thin Film Growth: Experimental

**Monday March 12 (AM)**

**Discussion Leader:** D. W. Kisker

**Speaker**

**Title of Presentation**

- |                      |  |
|----------------------|--|
| 1. S. Irvine         | Energy Assisted Epitaxial Growth of II-VI Semiconductor Thin Films                       |
| 2. E. Bauser         | Semiconductor Liquid Phase Epitaxy: Growth and Properties of Layers and Heterostructures |
| 3. M. L. Steigerwald | Growth of Quantum Clusters   |

**SESSION TITLE:** II-VI Compounds

**Monday March 12, (PM)**

**Discussion Leader:** A. L. Gentile

**Speaker**

**Title of Presentation**

- |                |   |
|----------------|---|
| 4. T. Taguchi  | Growth of Strained-Layer-Superlattices of Wide-Gap ZnS-ZnSe and CdZnS-ZnS by Low Pressure OMCVD |
| 5: J. Schulman | Novel Properties and Applications of II-VI Superlattices and Quantum Wells                      |

**SESSION TITLE:** Short Verbal Presentation of Poster Papers

**Tuesday March 13, (AM)**

**Discussion Leader:** R. A. Laudise

1, 2, 3. Posters (Approx. 20 total)

**SESSION TITLE:**Thin Film Growth / Interfaces: Modeling

**Tuesday March 13, (PM)**

**Discussion Leader:** W. A. Tiller

**Speaker**

**Title of Presentation**

- |                   |   |
|-------------------|---|
| 4. F. Rosenberger | Modeling of Growth Morphology with Anisotropic Surface Kinetics |
| 5. G. H. Gilmer   | Molecular Dynamics Studies of Heterointerfaces                  |

**SESSION TITLE:** High  $T_c$  Superconductors      Wednesday March 14, (AM)

**Discussion Leader:** E.A. Giess

<b><u>Speaker</u></b>	<b><u>Title of Presentation</u></b>
1. D.A. Cardwell	Properties and Processing of High $T_c$ Superconductors
2. C. D. Brandle	The Growth of Oxide Crystals for Superconductor studies
3. R.S. Feigelson	Growth of High $T_c$ Superconducting Fibers

**SESSION TITLE:** Crystals for Photonics      Wednesday March 14, (PM)

**Discussion Leader:** P. Bordui

<b><u>Speaker</u></b>	<b><u>Title of Presentation</u></b>
4. R. H. Hopkins	Crystals for Mid-infrared, Acousto-optic and Non-linear Applications
5. D. Eimerl	Crystal Growth and Properties of Non-linear Optical Materials for Visible and Ultraviolet Applications

**SESSION TITLE:** Melt Growth: Modeling      Thursday March 15, (AM)

**Discussion Leader:** D. T. J. Hurle

<b><u>Speaker</u></b>	<b><u>Title of Presentation</u></b>
1. M. E. Glicksman	Melt Growth/Dendritic Fundamentals
2. A. A. Wheeler	Analytical Modeling of Melt Growth Processes
3. J. Volkl	Modeling Dislocation Generation in Czochralski Crystal Growth of Semiconductors

**SESSION TITLE:** Melt Growth: Experimental      Thursday March 15, (PM)

**Discussion Leader:** W. A. Bonner

<b><u>Speaker</u></b>	<b><u>Title of Presentation</u></b>
4. K. Tada	Growth and Characterization of InP single Crystals
5. R. Henry	Vertical Zone Melting Growth of GaAs

**SESSION TITLE:** Characterization      Friday March 16, (AM)

**Discussion Leader:** F. Szofran

<b><u>Speaker</u></b>	<b><u>Title of Presentation</u></b>
1. K. Sangwal	Chemical Etching: Principles and the Present Status
2. P. H. Fuoss	The Atomic Nature of Epitaxy: Using X-ray Analysis to Understand OMCVD Growth
3. H. P. Strunk	Electron Microscopy of Semiconductors

**SPECIAL ITEM:**

Exhibition and Report of Recent Oxide Crystals Grown at the Shanghai Institute of Ceramics, China Given by Prof. He Chong-Fan

**Friday March 16, Conference Ends After Lunch**

**NOTE:** Papers 1hr. max. including generous question time.

# POSTER PROGRAM

- 1    He Chong-Fan                      Crystal Growth at Shanghai Institute of Ceramics, China, and Exhibition of Crystals. (S.I.C., China)
2.    Derby / Brandon                   Modeling of Effects of Internal Radiative Transport in Czochralski Crystal Growth. (U of Minnesota)
3.    Colombo / Liao / Shaw            Application of Numerical Simulation on the Growth of (Hg,Cd) Te films by Liquid Phase Epitaxy. (T.I.)
4.    Maroudas / R.Brown                Modelling of Impurity and Dislocation Dynamics in CZ Grown Si and LEC Grown III-V Semiconductors. (MIT)
5.    D-Hyun Kim / R.Brown              Modelling of Growth of II-VI Semiconductors by the Vertical Bridgman Method. (MIT)
6.    Casagrande / M.Brown              The Growth by Vertical Bridgman and Characterization of Large Diameter CdTe Crystals. (Grumman)
7.    Andrews / Walck et al             Microhardness Variations in II-VI Semiconducting Compounds as a Function of Composition. (UAH and MSFC, Huntsville)
8.    Szofran / Perry / Lehoczký        Automated Compositional Mapping of Narrow Band Gap Alloy Semiconductors. (MSFC, Huntsville)
9.    Atherton                            Characterization of Defects in LiCaAlF<sub>6</sub>:Cr. (L.L.N.L., Livermore)
10.   Macrander / Lau                   X-ray, Photoluminescence and Stoichiometry Mapping of In<sub>1-x</sub>Ga<sub>x</sub>As<sub>y</sub>P<sub>1-y</sub>. (AT&T Bell Labs, MH)
11.   Bordui / Bird et al                Processing of Periodically-Poled Lithium Niobate for Nonlinear Optical Applications. (Crystal Technology, Palo Alto)
12.   Morris                            Crystal Growth of and Defects in Nonlinear Optical Oxide Crystals. (DuPont, Wilmington)
13.   Logan / Tanbun-EK / Chu           Growth of Quantum Wells in the InGaAsP System by MOVPE. (AT&T Bell Labs, MH)
14.   Cox                                Vapor Levitation Epitaxy of Quantum Wires and Wire-like Structures Using Laterally Propagating Surface Steps. (Bellcore, Red Bank)
15.   Bourret / Elliott                  Growth of Semi-insulating and Doped GaAs single Crystals Using the VGF Technique. (Lawrence Berkeley Labs./ HP, San Jose)
16.   Ramesh / Bonner et al            Engineering of Active and Passive Substrates for the Growth of High Temperature Superconductor Films. (Bellcore, and Rutgers U)
17.   Greedan / Garrett et al           The Growth and Characterization of Uranium Transition Metal Silicide Heavy Fermion Superconductors. (McMaster U, Hamilton; and AT&T Bell Labs)
18.   Taborek                            Growth and Characterization of Diamond Films. (U of CA at Irvine)
19.   Banan                              Directional Solidification of InGaSb Crystals (Clarkson U)
20.   Parsons                            Beta SiC Epitaxial Growth on TiC Substrates (Oregon Graduate Center)
21.   Wei                                Radiation Resistance and Fluorescence of Europium Doped BGO Crystals

# GORDON RESEARCH CONFERENCES

Crystal Growth  
March 12-16, 1990  
Casa Sirena Resort  
Oxnard, California

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